Workshop Regarding Regulatory Fuels Activities

March 5, 2002

California Environmental Protection Agency

Air Resources Board

Agenda

- Introductions
- Evaluation of Diesel Engine Lubrication Oils, and Diesel Fuel Lubrication Properties
- Review of De Minimis Levels for MTBE and Other Oxygenates in CaRFG3
- Other Miscellaneous Changes for CaRFG3
- Presentations by Others
- Open Discussion
- Closing Remarks

Sulfur Levels in Lubricating Oils

- Sulfur content of diesel engine lubricating oils range from 2,500 to 8,000 ppm
- Sulfur contributions to finished lubricating oils
  - Base stock: from essentially sulfur free up to 4,000 ppm
  - Additives: typically 2,500 ppm to 3,000 ppm sulfur
- Worst case estimate for sulfur contribution of lubricating oils to exhaust
  - 7 ppm maximum equivalent fuel sulfur contribution based on:
    - 8,000 ppm sulfur content in lubricating oil
    - nominal oil usage of 1 quart every 2,000 miles
    - heavy duty diesel engine fuel usage of 6 miles per gallon

APBF-DEC Lubricants Work Group Phase 1 Testing

- Objective
  - Determine impact of lubricant properties and composition on engine-out/catalyst-in emissions
    - Evaluate matrix of additives with four different base stocks
    - Test engine: Navistar T444E
- Status:
  - Completed testing with Group II base stock oils
  - Remainder of test oils are being blended
- Schedule:
  - Testing expected to be completed in April 2002
  - Data reduction and reporting to be completed by June 2002

APBF-DEC Lubricants Work Group Phase 2 Testing

- Objective
  - Evaluate impact of lubricant formulations on performance and durability of advanced diesel emission control systems
    - Bench scale testing has been eliminated
    - Phase 1 test cell and test engine will be used for Phase 2
    - Added scope: accelerate lubrication oil effects to simulate long term aging of catalyst
- Schedule:
  - Test protocol development and evaluation to be initiated April 2002
  - Evaluation of test oils to commence ~ August 2002
  - Testing to be complete ~ August 2003
  - Data evaluation and reporting to be complete December 2003

Initiating Regulatory Development Process

- Start process to consider possible diesel engine lubricating oil specifications:
  - Recommended interim specifications
  - Formal specifications to support 2007 emissions standards
- Time frame: recommendation to Board this year?
- Expected scope: limit sulfur/ash content of lubricating oil base stock with recognition of appropriate levels to ensure engine protection

Initiating Regulatory Development Process (continued)

- Gather information from industry via meetings and survey
  - Sulfur/ash content of lubricating oils being sold in California
  - Engine requirements
- Conduct stakeholder workshops beginning March/April 2002
- Continue to follow APBF-DEC testing

ASTM Moving Forward with Lubricity Standard

- ASTM lubricity standard proposal being prepared for balloting at subcommittee level prior to next ASTM meeting in June 2002
- Parallel effort:
  - ASTM Diesel Fuel Lubricity Task Force completing round robin program
    - Pump stand testing on-going
  - Modifications of Ball on Three Discs (BOTD) and High Frequency Reciprocating Rig (HFRR) tests being investigated
- Standard will be updated as appropriate

Review of De Minimis Levels for MTBE and Other Oxygenates in CaRFG3

CaRFG3 Basic Prohibition of MTBE

- Starting December 31, 2002, no California gasoline produced with the use of MTBE.
- Timetable for reducing residual MTBE levels
  - Limits that must not be exceeded
    - Starting December 31, 2002: 0.3 volume %
    - Starting December 31, 2003: 0.15 volume %
    - Starting December 31, 2004: 0.05 volume %

Evaluation of Oxygenate Prohibitions

- Board Resolution 99-39 directed the Executive Officer to further evaluate the practicality of allowable MTBE residual limits for CaRFG3, and return with recommendations.
- Evaluate de minimis MTBE levels
  - Residual MTBE in retail non-MTBE gasoline
  - MTBE in current blendstocks

Survey of Retail Stations

- Objectives
  - Determine residual MTBE in non-MTBE gasoline (i.e., MTBE level does not exceed 0.6 volume %)
  - Determine levels of oxygenates other than MTBE and ethanol
- Retail Stations
  - Nine in Lake Tahoe area
    - CaRFG with ethanol
    - Non-oxygenated CaRFG
  - Twelve in Bay Area
    - Non-oxygenated gasoline
    - MTBE gasoline
    - No ethanol containing gasoline

Results of Evaluation (cont.)

- Retail gasoline
  - Low levels of MTBE in gasoline from Lake Tahoe area and Bay Area
  - More time might be needed to flush MTBE out of the distribution system
  - TAME was the only oxygenate detected other than MTBE and ethanol
    - detected in Bay Area
    - gasolines contained both MTBE and TAME
    - TAME provided 30 to 35 % of total oxygen

Residual MTBE Levels in Gasoline from Various Retail Stations

Location/Fuel	MTBE (Volume %)
Lake Tahoe/Ethanol	0.16 - 0.25
Lake Tahoe/Non-oxy	0.27 - 0.33
Bay Area/Non-oxy	0.00 - 0.26

Residual MTBE Oxygen Levels in Gasoline from Various Retail Stations

Location/Fuel	Wt. Percent Oxygen	
	MTBE	Total
Lake Tahoe/Ethanol	0.03 - 0.05	2.01 - 2.20
Lake Tahoe/Non-oxy	0.05 - 0.06	0.05 - 0.06
Bay Area/Non-oxy	0.00 - 0.05	0.00 - 0.05

Amendments of MTBE Prohibitions

- Reduce de minimis levels in four steps instead of three and delay implementation dates for current levels
  - Initial 6-month phase with de minimis limit at 0.60 vol.% (same as labeling requirement for non-MTBE gasoline)
  - The de minimis level of 0.3 volume % would be effective starting July 1, 2003 instead of Dec. 31, 2002
  - Allow 18 months instead of 12 months to reduce level from 0.3 to 0.15 vol.%
  - Final prohibition level of 0.05 vol.% effective 12 months later

New Draft Definition

- "Produced with the use of" a particular oxygenate means manufactured in part by adding the oxygenate to the fuel blend, or by using a blendstock to which the oxygenate has been added. Excluding:
  - Use of a blendstock in which limited amounts of the oxygenate have been generated as an unavoidable byproduct in the production of the blendstock; and
  - Incidental commingling of gasoline or gasoline blendstock with another product containing the oxygenate during transfer operations or changes in service of storage equipment.

Current and Proposed MTBE De Minimis Specifications for CaRFG3

Allowable Residual MTBE Levels (volume %)	Effective date	
	Current	Proposed
0.60	--	Dec. 31, 2002
0.30	Dec. 31, 2002	July 1, 2003
0.15	Dec. 31, 2003	Dec. 31, 2004
0.05	Dec. 31, 2004	Dec. 31, 2005

Other Oxygenate Prohibitions

- De minimis levels for oxygenates other than ethanol and MTBE
  - Oxygenates in current blendstocks
  - Future blendstocks as sources of oxygenates
    - Akylate produced in converted MTBE plants
    - Alcohols and ethers as byproducts
    - Alcohols and ethers as transportation contaminants

CaRFG3 Basic Prohibition of Oxygenates Other Than MTBE and Ethanol

- Starting December 31, 2002, ethanol will be the only approved oxygenate for use in CaRFG3
- The prohibition applies unless:
  - Multimedia evaluation of oxygenate use, and
  - Approved by California Environmental Policy Council
- CaRFG3 did not set de minimis levels for oxygenates not approved by California Environmental Policy Council

Results of Evaluation

- Current blendstocks
  - Results provided for one commercial sample of iso-octane
    - 0.055 weight percent oxygen from various oxygenates present at trace levels.
    - Oxygenates would not be detected when blended into gasoline
- Future blendstocks
  - Isooctane: 0.01 - 0.06 wt.% oxygen
  - Isooctene: 0.4 - 0.7 wt.% oxygen
  - More than 80% of total oxygen in isooctene comes from C8 ethers

Possible Amendments of Prohibitions for Oxygenates other than MTBE and Ethanol

- Set limit on total oxygen content in finished gasoline
- Oxygenates are defined by the U.S. EPA registration of oxygenates and Sub-Sim provisions.
- Use ASTM D 4815-99 to determine contribution of non-MTBE/ethanol oxygenates.
- Oxygen content will be calculated from sum of oxygenates other than MTBE or ethanol.
- Non-detects will be counted as zero.

Oxygenates Other than MTBE and Ethanol

Methanol
Isopropanol
n-propanol
n-Butanol
iso-Butanol
sec-Butanol
tert-Butanol
tert-pentanol (tert-amylalcohol)
Ethyl tert-butylether (ETBE)
Diisopropylether (DIPE)
Tert-amylmethylether (TAME)

Possible Amendments of Prohibitions of Oxygenates other than MTBE and Ethanol (cont.)

- Reduce residual oxygen levels in two stages
  - Initial 6-month phase with de minimis level of 0.1 wt.% for the total oxygen concentration of prohibited oxygenates. (this oxygen level is equivalent to the initial MTBE de minimis level)
  - Starting July 1, 2003, the total oxygen concentration from all of the prohibited oxygenates cannot exceed 0.06 percent by weight.

Other Miscellaneous Proposed Changes

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- **Section 2262.4.**(b)(2) **Regulatory control periods for production and import facilities.**
  - (D) *May 1 through September 30:*
    - North Coast Air Basin (Added)
    - *North Central Coast Air Basin (Removed)*
  - (E) *May 1 through October 31:*
    - North Central Coast Air Basin (Added)
    - *North Coast Air Basin (Remove)*

Other Miscellaneous Proposed Changes (cont.)

- Ethanol Content of Enforcement Handblends
  - Use 5.7%, 7.7%, or 10.0% for standard oxygen ranges
  - For all other ranges
    - %EtOH = 620 / ((218.8/%Oxy)-0.40), Where %Oxy is the midpoint of the specified oxygen range for the final blend

Presentations by Others

Open Discussion

Closing Remarks